REMARKS/ARGUMENTS

Applicant respectfully request Examiner's reconsideration of his rejections of the present application.

Claims 1 – 8 remain pending in the present application.

A replacement Declaration under 37 C.F.R. §1.131 has been included in this Office Action response. The Declaration submitted in response to the Office Action of June 3, 2003 did not comply with the rules under 37 C.F.R. §1.131. Applicant believes that this replacement Declaration complies with Patent Office requirements.

The §103 Rejections

Claims 1 and 2 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Rangarajan et al.* (U.S. Patent 6,376,013) and *Pollak et al.* (U.S. Patent 5,270,797).

Claims 3 - 8 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Rangarajan et al.* (U.S. Patent 6,376,013) and Pollack et al. (U.S. Patent 5,270,797) as applied to claims 1 and 2, and further in view of *Sanada* (U.S. Patent 5,985,357).

The Cited References

Rangarajan et al. is directed to a system and method is provided that facilitates the application of a uniform layer of photoresist material spincoated onto a semiconductor substrate (e.g wafer). The present invention accomplishes this end by utilizing a measurement system that measures the thickness uniformity of the photoresist material applied on a test wafer by a nozzle, and then adjusting the viscosity of the photoresist material by varying the ratio in a solvent/resist mixture, and/or adjusting the temperature of the mixture. A system and method that employs a plurality of nozzles is also provided that disperses resist at different annular regions on a wafer to facilitate the application of a uniform layer of photoresist material spincoated onto the wafer. The system and method utilize a measurement system that measures the thickness and thickness uniformity of each layer of photoresist material applied at each annular region

of the wafer. The measured thickness uniformity and overall thickness for each annular region is then used to adjust the volume and viscosity of a solvent/resist mixture applied through each nozzle (Abstract). Furthermore, as the Office Action states, "*Rangarajan et al.* does not disclose using a plurality of illumination intensities or controllers for adjusting the illumination intensities."

Pollak et al. is directed to a method and apparatus for determining the characteristics of materials, particularly of semiconductors, semiconductor heterostructures and semiconductor interfaces by the use of photoreflectance. The Office Action states, *Pollak et al.* discloses "using a plurality of illumination intensities (Fig. 1, Item 18) and controllers for adjusting the illumination intensities (Fig. 1, Item 21)." Item18 is "the variable neutral density filter 18 connected to the servo system 16, 17. The variable neutral density filter 18 is placed in the optical path between the probe monochromator 11 (or other probe source such as a dye laser) and sample 12. . . .The d.c. signal from the detector 15 (V_{dc}) is fed to the servo 16 which varies the variable neutral density filter 18 and hence . . . . in order to keep V_{dc} constant. Thus in this procedure, the operating conditions of the experiment, i.e., detector amplification, instrumental resolution, etc are kept constant. (col. 4 line 40 –55)."

Sanada et al. relates to methods and apparatus for supplying a treating solution such as photoresist or developer to substrates such as semiconductor wafers, glass substrates for photomasks, glass substrates for liquid crystal displays or glass substrates for optical disks (hereinafter referred to simply as substrates or as wafers). More particularly, the invention relates to a technique of treating the surface of each substrate by supplying a treating solution in a predetermined fixed quantity thereto based on a prestored processing program with a plurality of instructions including a supply start instruction and a supply stop instruction for performing a series of processes. Furthermore, as the Office Action states, *Sanada et al* discloses a known interferometry system utilizing a photodiode(6c) for illuminating the substrate (col. 6, lines 39-42. Applicant respectfully points out again, that photodiode 6c is used only as a detector since infrared projector (6b) is used for illumination.

Applicants' Invention

In contrast with the cited references, Applicant's invention relates to an apparatus that applies photosensitive material to a semiconductor wafer. The present invention has been found to be particularly suited for forming photoresist layers on substrates that have consistent thickness and uniformity across the wafer surface from lot to lot.

The Argument

Claims 1 and 2

Applicant respectfully reiterates his traversal of the Office Action's rejection. *Rangarajan et al.* fails to suggest or teach Applicant's claimed invention.

Claim 1 includes, *inter alia* the means for illuminating the substrate, means for adjusting the illumination on the substrate to determine reflectivity of the substrate, and means for controlling the dispensing of material as a function of the adjusted illumination.

Unlike Applicant's claimed invention, the system, as mentioned earlier in *Rangarajan et al* is focused on measuring the thickness uniformity of the photoresist material applied on a test wafer by a nozzle, and then adjusting the viscosity of the photoresist material by varying the ratio in a solvent/resist mixture, and/or adjusting the temperature of the mixture. A system and method that employs a plurality of nozzles is also provided that disperses resist at different annular regions on a wafer to facilitate the application of a uniform layer of photoresist material spincoated onto the wafer

With respect to the requisite evidence for the alleged motivation to make the combination has asserted in the Office Action, a significant body of authoritative case law clearly indicates that such evidence must be found in the prior art.

In the historic case, *Eibel Process Co. v. Minnesota & Ontario Paper Co.*, 261 US 45 (1923), established the rule the discovery of the source of a problem may result in a patentable invention despite the fact that the solution would have been obvious once the source of the problem was discovered. The cited reference does not suggest the solution of Applicant's invention in addressing a long-felt need, as it relates to a photoresist dispense arrangement.

The dispensing step is performed by distributing photoresist solution over the entire wafer before the wafer is spun (static dispense) or by applying a small quantity of solution near the center of the wafer while spinning the wager to distribute the solution (dynamic dispense). During the dispensing step, it is desired to distribute the solution uniformly onto the wafer to allow the formation of a coat of uniform thickness during the spin step. The dispensing apparatus should be maintained at a pre-defined, relatively close distance from the wafer to prevent splashing of the solution. Advanced photoresist dispensing methods have varied wafer rotation speed during chemical delivery of the spin coating cycle in order to achieve uniform photoresist coatings with minimal loss in photoresist material. However, this approach has not always been sufficiently precise in forming the photoresist layer.

In an effort to improve these systems, a light source has been included in the system that is directed at the substrate so that light is reflected up for detection by a camera. Variations in the wafer surface lead to variations in the light reflected. When the camera senses that the substrate is dark (less light reflected up to the camera), more photoresist material is dispensed. The opposite is also true; less photoresist is dispensed if the light reflected off the substrate is too bright. However, the process for depositing photoresist is problematic when the light reflected from the substrate is too dim or the light appears washed out. Variations in wafer surface reflectivity have made it difficult to reproduce from one wafer lot to another, a photoresist layer on a wafer substrate that has a uniform thickness across the wafer surface while at the same time minimizing the required amount of photoresist being dispensed. (Specification, page 2, lines 13-24 through page 3, lines 1-12)

In another case, *Ruiz v. A.B. Chance Co.*, 234 F .3 654,57 U.S.P.Q.2d 1161 (Fed. Cir. 2000), indicates that the alleged motivation for combining the references is to be suggested by the references ("Our court has provided [that the] motivation to combine may be found explicitly or implicitly: 1) in the prior art references themselves; 2) in the knowledge of those of ordinary skill in the art that certain references, or disclosures in those references, are of special interest or importance in the field; or 3) from the nature of the problem to be solved, "leading inventors to look to references relating to possible solutions to that problem.").

With respect to the problems addressed by the cited prior art and the claimed invention (as applied to photoresist dispense apparatus), the M.P.E.P. and case law fully support the notion in the statute that the claim must be considered "as a whole" (35 U.S.C. §103(a)) which contemplates the problems discovered, discussed, and addressed by Applicant's claimed invention. See, for example, M.P.E.P. §2141.02 which clearly indicates that discovering the source or cause of a problem is part of the "as a whole" inquiry; *see also In re Sponnoble*, 405 F.2d 578,585, 160 U.S.P.Q. 237,243 (CCPA 1969). In this instance, the Examiner has entirely ignored the problems discovered, discussed and addressed by Applicant's claimed invention and has also entirely ignored the problems being addressed by the prior art. As mentioned above and discussed more fully below, these problems being addressed by the prior art have nothing to do with the claimed invention and they cannot be disregarded when considering a modification to the prior art. Because of the lack of any such nexus in this regard, considering the claimed invention "as a whole" (as required by35 U.S.C.§ 103(a)), the Examiner's argument that the skilled artisan would- be led to implement the modification is clearly rebutted.

Furthermore, the attached replacement Declaration under 37 C.F.R. §1.131 shows that Applicant had conceived of his invention prior to filing date of October 6, 1999 of *Rangarajan et al.* Furthermore, the Invention Disclosure outlined in the attached Exhibit was prepared by the Inventor prior to the filing date of October 6, 1999. Therefore, *Rangarajan et al.* is removed as a reference. Consequently the primary reference, *Rangarajan et al.* is no longer applicable to invoke a rejection under § 103(a).

Pollak et al. does not disclose Applicant's method of adjusting the illumination on the substrate. In addition, the Office Action concedes that *Rangarajan et al.* and *Pollak et al.* do not disclose a first detect that can detect initial contact of the material with the substrate (Office Action, Page 5). Alone or in combination with *Rangarajan et al, Pollak et al.* does not render Applicant's claimed invention obvious.

Claims 3 through 8

The argument presented with respect to claims 1 and 2 *supra* applies to the discussion of claims 3 through 8, as well.

With respect to *Sanada et al.* as the Office Action states, *Sanada et al* discloses a known interferometry system utilizing a photodiode (6c) for illuminating the substrate (col. 6, lines 39-42. Applicant respectfully points out again, that photodiode 6c is used only as a detector since infrared projector (6b) is used for illumination.

Furthermore, Applicant respectfully takes exception to the Office Action's assertion that "the use of non-reflective walls for the chamber and other elements is well known and conventional in photoresist applications (Office Action, Page 4)" As discussed supra, Applicant's invention had addressed a long-felt need in the industry to reduce the exposure of photoresist via stray light. "The photo resist material deposition system 30 can be located (see Figure 4) within an enclosure 60 that is comprise of walls that have surfaces that have been coated with non-reflective material. . .Further, the internal light source 16 has light waves 20 either illuminating substrate 12 or having stray waves absorbed by one of the walls of enclosure 60 to prevent light from coming back to the substrate and distorting the amount of light being detected by camera 18. (Specification, Page 8).

Conclusion

In light of the arguments presented, the §103(a) rejection is improper and should be withdrawn.

Therefore, claims 1 and 2 are allowable. Dependent claims 3 – 6 are also allowable since they depend upon allowable claim 2. Claims 7–8 are allowable in light of the arguments presented.

Applicant believes he has addressed the Examiner's concerns. Therefore, the claims are now allowable over the cited references. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Please charge any fees other than the issue fee and credit any overpayments to Deposit Account 14-1270.

Respectfully submitted,

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